

THE  
PHYSIOLOGICAL ACTION  
AND  
THERAPEUTIC USE  
OF  
CHLORAL.

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# THE PHYSIOLOGICAL ACTION AND THERAPEUTIC USE OF CHLORAL.

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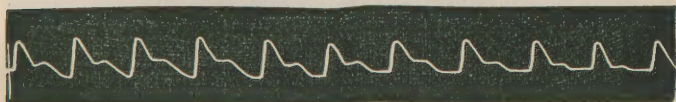
Continuing investigations into the effect of remedies upon the circulation, as shown by the sphygmograph, we present this paper upon chloral. Experiments to determine differentially the effect of chloral in health and disease, have been made, and frequent pulse tracings taken. The following experiments were made upon a person in a state of health. The range of dose was from 10 to 60 grains.

## EXPERIMENT WITH 10 GRAINS.

The pulsations were reduced 6 in the minute, and slightly increased in volume. Drowsiness scarcely observable.

## EXPERIMENT WITH 20 GRAINS.

Trace before taking chloral.



Number of pulsations 78 to the minute.

Trace 5 minutes after.



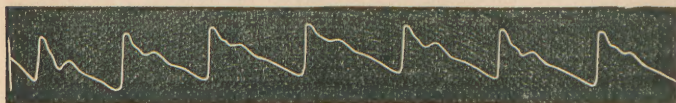
Number of pulsations 72 to the minute.

[NOTE.—We present only a section of the tracing for 10 seconds, but sufficient to show the character of the pulse.]



In the trace taken 25 minutes after, the pulsations were 66 to the minute, and increased in volume, as shown by the greater depth of the perpendicular line.

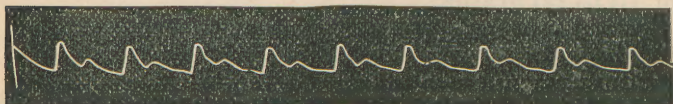
Trace 50 minutes after.



The pulsations have fallen to 54 to the minute and the volume is notably increased. This presents the most marked change. From this time the pulse gradually resumed its original character. The sensation of drowsiness was increased, but sleep was not induced.

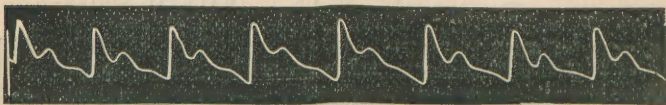
EXPERIMENT WITH 30 GRAINS.

Trace before taking chloral.



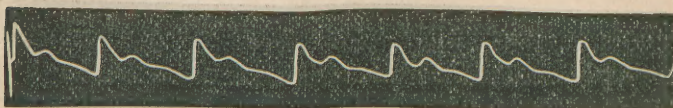
Number of pulsations 84 to the minute. In ten minutes they were 72 to the minute.

Trace 20 minutes after.



Number of pulsations 66 to the minute. Much increased in volume.

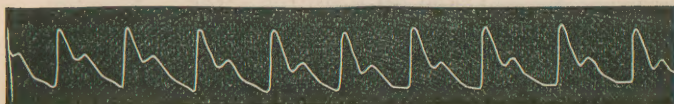
Trace 60 minutes after.



Number of pulsations 60 to the minute. Lessened in volume, but retained original form of trace. The sensation of sleepiness was easily resisted.

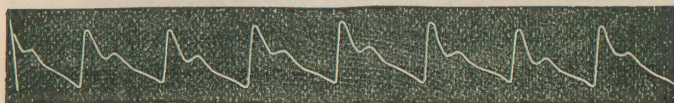
EXPERIMENT WITH 40 GRAINS, given an hour after a full meal, and when digestion was at its height.

Trace before taking chloral.



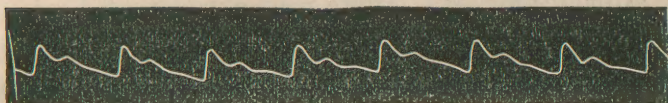
Number of pulsations 78 to the minute. Fifteen minutes after, the pulsations were 72 to the minute.

Trace 30 minutes after.



Number of pulsations 66 to the minute. No marked change in the volume.

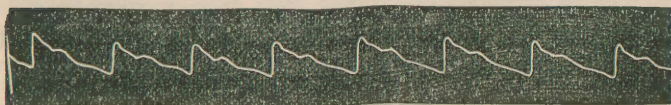
Trace 90 minutes after.



Number of pulsations 60 to the minute; much reduced in volume. This state of the pulse continued some hours. There was a more marked sensation of drowsiness, which was with difficulty resisted.

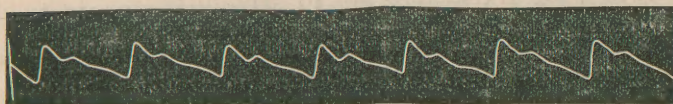
EXPERIMENT WITH 60 GRAINS.

Trace before taking chloral.



Pulsations 66 to the minute.

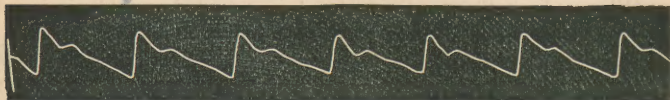
Trace 30 minutes after.





Pulsations 60 to the minute. No marked change in the character of the trace.

Trace 75 minutes after.



Pulsations 54 to the minute.

Trace 3 hours after.



Pulsations 54 to the minute. Greatly lessened force in the heart's action. This character of the pulse was continuous for some hours.

The effect of the dose was felt within three minutes after taking it. There was a sense of heat and burning in the stomach, and a tingling sensation in the extremities. Drowsiness was experienced, and a strong effort was demanded to keep the eyes open. In fifteen minutes sleep followed in spite of resistance; but he was aroused while a pulse trace was taken; he was then talkative, tongue was thick, speech indistinct, and he presented the characteristics of intoxication. After half an hour there was a contraction of the pupil as in natural sleep. There was no complaint of pain or abnormal sensation in the head. After one and a half hours he fell asleep, and slept for an hour: awoke, and after three hours was again overcome by sleep for an hour. The respirations were undisturbed and normal, and the sleep quiet and natural. He was easily aroused, but readily went to sleep again. After three and one-half hours he awoke and took a hearty meal. His gait was unsteady, as if somewhat intoxicated. Five hours after taking the dose he went to sleep, and slept for four hours.

From the experiments, of which we present a few of a large number of tracings, we conclude, in regard to the physiological action :

1. That the effect of chloral is to reduce the number of pulsations. (In experiments from 84 to 54.)

2. That the primary action is to increase the force of the heart's action and arterial tension.

3. That in large doses, within safe limits, the pulsations are not reduced in number proportionately to the size of the dose ; but the effect is more prolonged.

4. That the secondary effect is to diminish the force of the heart's action and the arterial tension. This will be apparent by comparing the number of pulsations, and the diastole of the first tracing with the last in the fourth experiment.

These conclusions are in part confirmed by other sphygmographic experiments made by Dr. Anstie, Editor of the *London Practitioner*, who says, that the traces indicate an unmistakable elevation of arterial pressure. Bouchut also confirms the statement.

From twenty minutes to one hour after taking the dose, the phenomena attending its action can be well studied, and the most marked changes in the circulation will have taken place. These, as given by Liebreich, are disturbances of the mental, sensitive and motor nervous system, similar to those produced by chloroform ; with this difference, that the effect is more gradually secured and of longer duration. They are however, in the order in which we have observed them, a sense of heaviness of the head, a tingling of the extremities, a feeling of weight as if the part was asleep, and gradually increasing drowsiness. There is an inclination to talk, with thickness of tongue, and inability to speak plainly, especially if the patient is talked to, or otherwise disturbed. If he is quiet he yields readily to sleep, and this



intoxicating stage will not be as noted. Then occurs the profound sleep of the chloral. On awakening, if the effects have not completely passed off, there may be a recurrence, in a mild degree, of the stage of intoxication.

Liebreich asserts, and this has been confirmed by subsequent observers, that chloral acts by being decomposed by the alkalinity of the blood, with the evolution of chloroform. In this view, giving chloral is but another mode of administering chloroform. The great and practical advantage is in the slowness of its action and its ready control. Those cases in which it fails, after a full dose, to produce the desired effect, are supposed to depend upon the acidity of the secretions of the system. The temperature of the body is somewhat reduced while under the influence of chloral in the usual dose, which tends to prove the assertion that the remedy contracts the capillaries, and thus repels the blood from the surface toward the centre of the body. The actual reduction after the ingestion of an ordinary dose, is according to Bouchut, usually but from 3-10 to 5-10 of a degree centigrade. The highest reduction he has ever seen, was 12-10 of a degree. Probably some of this lowering of the temperature may be due to the lessened cell metamorphosis, from the sedative action of the remedy; and hence, its value in fever, in which there is a high temperature, the result of rapid changes of cell tissue.

From the same authority we learn that the urinary secretion is profoundly modified. Directly after waking from the chloral sleep, little change in the urine is observed, but the next day it is increased in density. The cause of this change, Bouchut is inclined to attribute to the chloral which is eliminated through the kidneys.



Prof. Wherrell announces that the amount of uric acid is increased by the use of chloral. Of its effect on the brain, Bouchut says, that in consequence of retarded circulation, there results capillary congestion, and hence debility. Dr. Alex. Max Adams, in the *Glasgow Med. Journal* for May, 1870, says, chloral does not lead to congestion of the brain, and is therefore peculiarly applicable to the treatment of head affections. Our experience confirms this view. If congestion occurred, the waking from chloral sleep would not be without marked after-effects, and especially there would not be such rapid recovery of tone as is observed in cases where large doses have been administered.

Chloral has been used largely in the Asylum since February, 1870. The whole amount used is 90 lbs., which has been prescribed in 370 cases, as follows:

FORM.	M.	W.	TOTAL.
Mania, . . . . .	69	119	188
Melancholia, . . . . .	30	59	89
Dementia, . . . . .	18	50	68
Paresis, . . . . .	12	1	13
Epilepsy, . . . . .	2	2	4
Employés, . . . . .	3	5	8
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	134	236	370

The average length of time of administration has been to the men 39 days, to the women 43 days. In a case of melancholia marked by the most distressing delusions and wakefulness, it was given in 20 grain doses, for 257 nights, as a hypnotic, without losing its effect, and with the happy result of securing refreshing sleep. The patient recovered. In this case, as in others, the value of the remedy was tested by occasionally intermitting the dose. Sixty grains were administered during an attack of mania for 195 nights in succession.

The following is a tabular statement of a few cases in which the chloral was given nightly for a protracted period:

## MEN.

DOSE.	DAYS.	FORM OF DISEASE.
60 grains	195	Acute Mania.
40 "	126	Melancholia.
30 "	175	Melancholia.
30 "	105	Melancholia.
20 "	221	Melancholia.
20 "	255	Melancholia.
20 "	130	Melancholia.

## WOMEN.

DOSE.	DAYS.	FORM OF DISEASE.
40 grains	236	Acute Mania.
40 "	222	Acute Mania.
40 "	207	Melancholia.
30 "	195	Chronic Mania.
30 "	187	Chronic Mania.
20 "	257	Acute Mania.
20 "	159	Melancholia.
20 "	207	Melancholia.

In several of these cases the medicine is still continued, and in a few of them the dose has been repeated, once, twice or three times a day, in from 10 to 40 grains. The average dose employed is 30 grains. The limit from 10 to 120 grains. The latter dose was given in a case of profound melancholia, with good effect.

In cases of insanity of either an acute or chronic character, the great value of the remedy is as a hypnotic. In the result when used for this purpose, we are rarely disappointed. Patients who would otherwise be out of bed and noisy at night, to their own injury and the disturbance of a ward, are usually quieted and kept in bed, and at last put to sleep, by a dose of chloral timely administered. The great advantage to be derived from



a remedy of this character, can nowhere be more fully appreciated than in an institution for the insane. It is also administered during the day in smaller doses to act upon the motor nervous system, and as an ordinary nervous sedative.

#### Cases in illustration.

Man, acute mania, noisy, destructive, sleepless and talkative. He had been blind for four years and disease of the optic nerves had been diagnosed by Dr. H. D. Noyes, of New York, who gave the prognosis of disease of the brain and probably insanity. Prescribed at first 60 grains of chloral at night. This secured sleep, but maniacal violence continuing through the day, chloral was given in 20 grain doses three times a day.

Whenever the remedy was discontinued for a few days, he returned to the former condition of maniacal disturbance, and on its renewal, the excitement soon subsided: finally it was continued for three and one-half months, at which time the most prominent symptoms had yielded.

Woman, melancholia, depressed, moans, wrings hands, opposes care, endeavors to force doors, restless and sleepless. Sleep produced by 20 grains of chloral, and under the same dose, repeated twice a day, she is quiet and comfortable, and employs herself in sewing. Her delusions though still existing, have lost their controlling force.

The cases of dementia in which chloral has been employed are those attended with maniacal paroxysms, and the result has been the same as when given in mania. In paresis it has been administered in a majority of the cases under treatment during the year. Several of these were in the first stages of the disease, with exalted delusions attended with sleeplessness. Others were further advanced, noisy, sleepless, shouting,

violent, destructive. Chloral in 30 grain doses generally produced sleep and allayed excitement. In epilepsy, it has been given, during the maniacal period following a fit, with the same effect as in mania. It has been recommended as a remedy in epilepsy, but has not proved of any value, in our experience, in warding off or modifying the seizures.

The advantages of chloral are: It is a hypnotic which seldom fails to produce sleep, which usually lasts from four to eight hours.

The sleep is natural, and one from which the patient can be easily aroused.

It is more generally tolerated by the stomach than other sedatives.

It does not constipate the bowels or disturb the secretions.

It does not injuriously affect the appetite.

It rarely produces headache, or leaves unpleasant effects.

It does not lose its power by repetition, but the dose may often be reduced after the patient has become accustomed to its use, and seldom demands to be increased.

When the necessity for its use has ceased, it often for the first time, becomes disagreeable to the patient.

Thus far we have met with no case where its administration has induced the habit of its use, which is one of the dangers of opium, *Cannabis Indica*, &c.

It allays muscular spasm and rigidity.

No ill effects have been experienced from its use in cases of disease of the brain.

We have observed no ill effects from its use in the reduction of the pulse or of the temperature.

In cases of the opium habit, it has proved a valuable remedy to secure quiet and sleep, and allay nervous irritation until the system has rallied from the depress-



ing influence of the former drug. In insanity, it is particularly useful to quiet restlessness and muscular activity. The strength of the patient is thus preserved, and time is gained for building up the general health by tonics and nutritious diet.

*Its ill effects* we have observed are :

In some instances, it has induced nausea and vomiting.

Unless largely diluted it produces a burning sensation in the fauces and stomach.

In many cases its influence is very rapid, the person falling asleep at once, which sometimes gives alarm to those unused to it.

We give the following case in which its effect was unusual, and remarkably prolonged.

A young man, 29 years of age, was much broken down in health, from wounds, sickness, and exposure in the army. He was a prisoner for a long time, and so much debilitated from starvation in Andersonville, Florence, and other prisons, that he was delirious and unconscious for five days after having been exchanged. Was wounded in the shoulder, and right iliac region. This wound involved the crest of the ilium, and at date of writing, (May, 1871,) is still open. He suffered long after his discharge from chronic diarrhoea. In 1868, while on passage to Mexico, he was wrecked, and being without adequate food or shelter for several days, was much reduced in strength, and contracted yellow fever, from the effects of which he has never fully recovered. For past few months has been employed as an attendant in the asylum. For a week or so, he lost in appetite and general health, and in this weakened condition attended his brother while sick, and sat up with him three nights. The first night he slept some three hours, the last two, none. During forty-eight hours he ate little, and for twenty-four hours took no nourish-

ment, and smoked once. On Sunday morning, he returned to the asylum, took no food, was wakeful, nervous and excitable. Knowing the necessity of rest, and fearing he would not go to sleep without the aid of a sedative, he obtained from the apothecary the usual dose of chloral, 30 grains, in watery solution. He went to bed, passed into a dreamy condition, soon became uneasy and restless; kept getting out of bed, and staggered around his room and ward. He continued under full influence of the chloral till the following Friday morning. He then dressed himself with difficulty, but was unable to walk or stand alone; slept most of the time on a lounge or a chair. On Saturday he was able to stand alone, but was still sleepy, and during the night was restless and out of bed. On Sunday, one week from the day on which he took the medicine, he was fully awake, but had some nausea and loss of appetite. During the whole time he was nourished by liquid food, milk, soup and essence of beef. He was raised up in bed and fed, by being told to swallow, as each spoonful was given him. Milk punch was added to his diet, and continued three times a day. His bowels moved regularly, and he made known his desire to go to the closet, but was helpless. Anæsthesia was marked, and though when the limb was deeply pricked it was withdrawn, the action was purely reflex and without the knowledge of the patient. He lay with his hand under the right temple, and firmly pressed against it, and says that before he fell asleep, and after he awoke, he had a severe pulsating pain in the head. During the whole period, he had but two intervals of complete consciousness; one for a few moments on Tuesday morning, when he recognized the physician and talked coherently, though he fell asleep after each question and snored heavily, said



he was very sleepy, begged to be aroused, said that his eyes were blurred, and though he could distinguish faces, they were indistinct and moved toward him and then receded; that objects in the room rose before him as when intoxicated. The other interval was for a short time on Thursday afternoon. At any time of the whole period, if shaken and talked to, he could be made to reply, but had no recollection of it. His pulse varied between 60 and 65 beats, and was strong and full. There was no blueness of lips or disturbance of the circulation, and for this reason, little uneasiness was felt about the result. The pupils were contracted as in natural sleep. The action of the skin was undisturbed, and the urine normal under chemical and microscopic examination. The chloral taken was of Squibb's manufacture, and the same that is in constant use at the asylum. It was in fresh solution in water.

There are some interesting queries suggested by the case.

Was this condition due entirely to the action of the drug?

Was it the intoxicating effect of the chloral thus prolonged, or did the remedy simply induce a state of slumber of a cataleptic character, prolonged by the relaxation and reaction from the nervous tension, and by the abstinence from food during a long period of watching and anxiety? Dr. Coghill, of Edinburgh, has reported a somewhat similar case.

*Of the effects of Chloral on the eyes.*—In several instances soreness of the lids has been noticed when patients were taking the medicine, and, at first, it was attributed to the influence of the drug; but in none of the cases in which it has been taken for long periods has any such result occurred.

One case of paroxysmal mania was troubled with

inflammation of the lids, with profuse purulent discharge. This took place simultaneously with increased mental disturbance and when the patient was taking chloral; but during the last period of excitement, although the medicine was repeated in the usual dose, the inflammation has subsided, and the lids are in a normal condition. In other cases in which there has been redness and swelling, it has disappeared during the continuance of the remedy. No paralysis of the eyelid, which has been noted by some observers, has ever resulted in our experience of the use of chloral.

From the reports of institutions for the insane, we make a few extracts, in regard to the use of chloral.

Dr. Earle, of Northampton, says: "For rapidity and certainty of effect in that direction (producing sleep,) it appears to have no equal, unless it be opium. The sleep induced by it is more transient than that from opiates, but it has none of the disagreeable consequences that in some constitutions follow the use of them."

Dr. Brower, of the Eastern Virginia Asylum, says: "We have made a thorough trial of the remedy, and are satisfied it is a valuable addition to our *Materia Medica*."

Dr. Lewis, of the Northern Ohio Asylum, says: "it is a valuable addition to our means of procuring refreshing sleep in those cases laboring under acute or chronic mania. As a hypnotic it is superior to opium, it having produced sleep when the latter has entirely failed."

Dr. Shew, of the Connecticut Hospital for the Insane: "Having administered it to as many as one hundred persons of both sexes, of various ages and constitutional tendencies, we have no hesitation in saying: 1st. That it is the most sure and powerful of the sleep producing



remedies known to the profession. 2d. That it has little if any other influence than that just mentioned. 3d. It is better suited to the excited than the depressed forms of insanity. 4th. That the dose may vary from 15, to 60 grains. 5th. That a watery solution loses strength on exposure to light even when placed in a ground glass stoppered bottle. Sleep induced by an ordinary dose of chloral seems to be natural and refreshing. The patient is easily aroused, but usually speaks of being cold. If continued for several weeks a slight inflammation of the eyelids manifests itself, and in one case of violent chronic mania, when doses of sixty grains had been given as often as three times a day for several months, the bowels became slightly irritable."

Of its use in various other forms of disease we have had some experience in this institution. In cases of cerebro-spinal meningitis it has been employed with benefit to allay muscular rigidity and spasm. It produces relaxation, and relieves the tetanic contractions of the muscles of the back and neck.

Four cases of the same character, are reported in the *Indiana Journal of Medicine*, by Dr. Patton, in which the same effect was noticed. In chorea, also, a beneficial influence has been exerted upon the irregular muscular action. In one well marked case, where the head was kept in almost continuous motion, the disease yielded within a week to the use of 20 grain doses, given at night as a hypnotic. Bouchut gives four severe cases of this form of disease, in which the convulsive action was controlled, and the patients soon recovered, under use of the remedy. As a sedative in substitution for opium in cases addicted to this habit, it has proved useful. In the *Journal of Pharmacy*, a case is reported in which the patient took five oz., in five consecutive days, without injurious consequences. In a case of

opium habit by hypodermic injection of morphia, now under treatment, we have derived much benefit. We give the case in full.

Woman, single, age 30—had been addicted to hypodermic injections of morphia for three and one-half years, once, and much of the time twice a day, making in all about 2,000 injections. During the last few months had used a dram and one-half a week. She had accustomed herself to use the syringe, and inserted it perpendicularly to the surface. Each injection produced a small abscess, and the body was thickly covered with scars, wherever it could be reached by her own hand. She was much reduced in health, appetite destroyed, stomach rejected nourishment, was sleepless, and at last became noisy and maniacal. She had given up the use of the drug for a few days before admission. At this time she was pale and anæmic, and was carried to the ward in a very feeble state. For two days she was sleepless and retained no nourishment; was placed on the use of chloral in 30 grain doses. This was tolerated by the stomach: she gained sleep, the vomiting gradually became less, and soon ceased altogether. At time of writing, twenty days after admission, she is eating freely, and has gained flesh materially. No desire for the repetition of the injections exists.

In some cases of neuralgia in which it has been employed, it has produced sleep; but the patient has been restless and disturbed, and, when awakened, the pain has continued without intermission. When the sensation has been destroyed by a hypodermic injection of morphia, the insomnia which so frequently results from the opiate has been overcome, and the patient obtained refreshing sleep under chloral.

Its use in tetanus, puerperal convulsions, in allaying the pain of childbirth, in spasmodic diseases, as

whooping cough, in fevers, in incontinence of urine, and other diseases and conditions in which it has been recommended, has been fully discussed in the journals of the day.

Chloral has been used to a considerable extent in combination with other sedatives, especially hyoscyamus. This combination exerts a favorable influence in prolonging the chloral sleep, and making it less liable to be disturbed, when the effect of that remedy has begun to pass off. It has also been given with the bromides, to a less extent, but sufficiently to test the utility of the combination in certain cases. Dr. Hughes, of the Missouri State Asylum, has also used and recommends this combination to prolong the sedative impression of the chloral.

Much has been written, and the profession strictly cautioned, against the use of chloral in combination with alcoholic stimulants. No bad effect has been observed when it has been given with milk punch, beyond at times an increased degree of intoxication. Dr. McLeod, in the *London Practitioner* for August last, says: "I am inclined to prefer the stimulant, as practically I have found that patients, taking it in this way, have slept well, and the calmative after-influence was satisfactory, and the stimulant may prevent symptoms of prostration. The combination with paregoric and valerianate of ammonia is useful, and in many cases desirable. When given dissolved in syrup, as is so generally recommended, it often disagrees with the stomach and is distasteful to the patient, and less effective."

Dr. Squibb, of Brooklyn, says: "Ice-water appears to be about as good a vehicle for this, as for all saline substances, as any yet devised, and physicians who have now abandoned these mixtures (mucilage and syrup) for the simple solution, often, if not generally, advise their



patients to eat a cracker, or take some other light food in small quantity, before or immediately after an hypnotic dose." The standard house solution at the asylum is one of 80 grains to the ounce of water; this is largely diluted when dispensed. The solution is freshly made at least three times a week. The chloral used is of Squibb's manufacture, which is uniform and pure in quality.

Cases are reported in which large doses of the drug have been taken by prescription and through mistake, or for the purpose of suicide, with injurious and sometimes fatal results.

Dr. Williams, in the *Baltimore Medical Journal*, reports a case in which 600 grs. were taken at one dose, apparently with suicidal intention. The patient remained in a comatose state for eighteen hours, and soon after recovered entirely, without any remedial measures having been employed. Another case is reported in the *Chicago Examiner*, in which 240 grs. were taken by a lady in a state of bewilderment, while suffering from neuralgia. She remained in an unconscious condition for eighteen hours, but recovered, under the use of the galvanic current.

In the *Nashville Journal* is given a case which occurred in the Philadelphia Hospital service of Dr. Ludlow; 460 grains were taken at one dose. The patient fully recovered under prompt treatment.

In the *Pacific Medical Journal* a case is cited in which the patient was rendered comatose by a dose of 20 grs., but afterwards fully recovered. Three other cases are also mentioned, in the same connection, of a like character.

In the *English Practitioner* two cases are mentioned. A man and his wife each took chloral by mistake; the wife 120 grs., and the husband 180 grs. She slept 12

hours; he slept continuously for 26 hours. No ill effects were experienced in either case. Dr. Reynolds reports a case where dangerous symptoms were developed after a dose of fifty grains.

Dr. Fuller, in the *London Lancet*, reports a case in which 30 grs. twice produced alarming symptoms, and one in which the same dose produced death.

In the *Buffalo Medical Journal* a case of death is reported, where about 400 grs. were taken, seemingly with suicidal intent.

One case of death is reported in the *Medical News* of Philadelphia, in which the post mortem examination showed cerebral congestion.

In the *Medical Times and Gazette* (London) for April 15, two cases of death are given. Both were surgeons. One had extensive disease of the heart, and the other took, by mistake, an overdose; amount not stated.

We condense the following interesting report of a case of death, from the *London Lancet* for May, 1871;—by Hugh Norris, L. R. C. P.

Woman, 46, married; for seven years had been addicted occasionally to excessive indulgence in stimulating liquors. In November, 1869, had a severe attack of hysteria “complicated with spinal irritation.” When opposed in her desire for stimulants, became very violent, and attacked others. Chloral was the only remedy that proved of value in allaying excitement. This she took at night in doses of from 20 to 40 grains, and continued to do so most of the time, till her death in January, 1871.

On the 3d of January, 1871, the physician was hurriedly called and found she had taken some 10 oz. of Townsend’s sarsaparilla. She was in a fit of hysteria, but not considered in any danger. The Doctor gave her chloral, which he had discontinued during the last two

weeks of December. She took, by prescription, half dram doses till the 8th of January, when they were increased to an average of 50 grs. per day, in divided doses, morning and night.

She died, almost suddenly, about noon, on the 12th of January. After her death the Doctor ascertained that she had taken large doses of chloral, without his knowledge or suspicion. The amount taken, (including that by prescription and obtained clandestinely,) was as follows: on the 3d, 36 grs.; 4th, 36 grs.; 5th, 66 grs.; 6th, 66 grs.; 7th, 66 grs.; 8th, 96 grs.; 9th, 66 grs.; 10th, 158 grs.; 11th, 112 grs.—making a total of 712 grains in 9 days; the last 260 of which were taken in 35 hours.

An autopsy was held a hundred hours after death. "No odor from decomposition perceptible except in the air displaced from the lungs. There were scarcely any puncta sanguinea in the white portion of the brain, which was very fresh and firm, and little if any fluid in the ventricles. The liver was much enlarged, slightly congestive, and somewhat leathery. The kidneys were enlarged, but not apparently diseased. The heart tissue was somewhat pallid; the ventricles were empty; the auricles partially distended by dark semi-coagulated blood. Stomach not opened, body well nourished; other organs healthy but firm; no decomposition, no odor of chloroform."

A portion of the lung, liver, heart, kidney and spleen were submitted for analysis. From Mr. Stoddard's report we extract: "The first thing that struck me was the very extraordinary way in which the several portions were preserved. Even now, although more than a week has elapsed since death, yet not the slightest sign of decomposition has taken place, nor any unpleasant odor. This doubtless is the effect of chloroform in the tissues."



From the *contents* of the stomach when mixed with potash and soda, and subjected to distillation, drops of pure chloroform were obtained. This was also found in the liver, but in no other organs. There was no odor of chloroform from any of the tissues of the body, and *the contents of the stomach had no perceptible smell of it till after the addition of an alkali.*

Tests for all the poisons that were probable were used without success. Mr. Stoddard gives his opinion from the examination. "There seems no doubt that an excess of chloral must have been taken, and the resultant chloroform was so disseminated through the tissues that they were completely preserved."

As to the mode of death, Mr. Norris adopts the opinion of Dr. B. W. Richardson, "that in such cases, dangerous decomposition of the blood may occur before coma is produced, and that the repetition of considerable doses of chloral would be followed by the formation of formiate of soda in the blood, by which its coagulating power would be much diminished; and that in such cases the symptoms would be similar to those induced by loss of blood."

It is unfortunate that the post mortem was not made sooner after death than the lapse of four days, and also for the establishment of the truth of Dr. Richardson's theory in this case, that the blood and brain were not submitted for analysis. This the Doctor himself regrets. These are all the cases of death we have found reported in looking over a large list of exchanges for the past several months. Some cases of injurious effect and of death have, no doubt, escaped our search, while others have not been reported in the journals.

What medicine can be named, which has been used so extensively, which allows of such variable limits in dose, and which has passed into common use, even in

the hands of nostrum venders; and against which so small a list of casualties can be adduced? We know comparatively little of the drug, of its power for combination, of its decompositions when combined, or even when kept for any length of time. This opens an extensive field for experiment and study, and one which will require much time for thorough investigation; and till this is done, we cannot accurately judge of the real value of the remedy to the profession and the world.





